Exploring Dynamic Interactive Narrative

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# Abstract

*In the game industry and in electronic entertainment at large, a question is being posed as to how best to deal with interactive storytelling. In the past, interactive stories have been built in a tree structure, with alternate stories written that branch wherever the player gets to make a choice. Now, however, new attention is being paid to true dynamic storytelling, and the possibility of constructing a great number of quality stories through artificial intelligence and large scale design. My intention is to explore the current field of interactive storytelling, and attempt to devise and implement a system in which the story is dynamically generated around the input of the player.*

*Project Blog: http://dynamicstorytelling.blogspot.com*

# INTRODUCTION

It is a serious priority in the entertainment industry right now to create a form of interactive storytelling so that the audience might somehow gain control over the narrative. Unfortunately, the current “branching tree” system utilized by most interactive stories – from video games to choose your own adventure books – are prohibitively costly and time consuming. Any decision which branches the story requires a doubled amount of work from that point forward. A choice made early on in a story means that the rest of the story is written twice – once for each possible decision. In a video game, it means the rest of the game is made twice - in essence doubling the budget of the game to create content most gamers will never experience. Still, the industry is obsessed with adding interactivity to their stories, so a new model apart from the tree structure is needed.

In theory, a dynamically building story would mean that for less cost and less effort, audiences would get a story with much more variation than they could ever hope for from a branching tree system. Stories would redefine themselves based on the user to give the optimized story experience. Furthermore, with added random elements and subtle game interactions, the audience could have a completely different experience with each play through. The replayability of games would skyrocket. In theory, a future application could also be dynamically changing movies that are different every time you watch.

My approach would be to compartmentalize elements of story and program for interaction with other elements. Much like different weapons in games must be programmed to interact with other objects in specific ways, I believe certain characters, objects, and locations should be able to interact with others in such a way that builds the story in real time. Non player characters could have their own histories and personalities, and should exist outside of their interactions with only the player. In this way, the player can have a butterfly effect on the story – things that are said or done to characters cause them to react and interact with other non-player characters in a way that creates conflict and therefore builds a story. An example of a potential scenario – the player asks a character to go and get something for them, but when they do they bump into another character, one who deeply hates them. They get into a fight, and if there is a weapon nearby one might kill the other, creating the central conflict for the story. If the player removed the weapon from the room, then the fight would only be verbal, and might somehow become a catalyst for the central conflict of the story. I believe it is essential that there only be one major driving event for the story, and perhaps several subplots. At a certain point, an artificial intelligence crafting a story must stop looking for conflict and start looking for resolution.

This project makes the following contributions:

• A compilation of research done into dynamic interactive storytelling to this point

• A proposal for a new system of dynamic storytelling.

• An early implementation of said system.

## Design Goals

The target audience for my project is game developers, and those interested in electronic interactive entertainment in general. I hope to design a method of electronic interactivity that has the potential to make fully interactive story experiences a viable option for developers.

## Projects Proposed Features and Functionality

In my design project, I hope to implement:

* A basic A.I. character system, in which characters “behave” and so affect the story apart from the player
* A storytelling A.I. that looks for a central conflict and a resolution, and stops after they have been achieved (I would also like to allow it to search for subplots, if time permits).
* A small and basic “game,” either with graphics or text based, that showcases the way in which even the subtlest of actions can radically change not just the outcome but every component of the story.

# RELATED WORK

*Adaptive Storytelling and Story Repair in a Dynamic Environment*. Richard Paul, Darryl Charles, Michael McNeill, David McSherry (UK). – An paper detailing the shortcomings of linear stories as they are used in games today, including the thousands of scripted storyline options one might find in an MMORPG. The paper suggests some radical alternatives to linear storytelling that it believes might work, including some ideas I plan to build off of, but largely avoids specifics of a new structure. Most importantly, the paper devotes a lot of time to highlighting the biggest potential pitfall to adaptive storytelling – breaks in the continuity of a shifting story – and how to avoid it. [PCMM11b]

*Game A.I. as Storytelling*. Mark Riedl, Vadim Bulitko, David Thue. – A basic but still helpful presentation on how to use A.I. as architecture for storytelling. The system used here is more simplistic than the one I hope to implement, in that it still has a baseline “ideal story” which the player is able to take control of and change (rather than a largely randomized and generated from scratch story that might surprise even the game creator). Even so, there are certain elements of my planned game management A.I. that I could build off of theirs, such as how to have the A.I. keep track of what story changes make sense next (though I’d need to devise my own way of coming up with how to handle major story beats). [RBT11]

*“Behind the Façade”Guide*. Procedural Arts. – A behind the scenes “how it was done” guide to the popular interactive story Façade, which is known for the depth and subtlety the user interaction has on the game’s story. Useful, because I am still uncertain as to the ways in which I might be able to integrate user interaction.

*MIST: An Interactive Storytelling System with Variable Character Behavior*. Richard Paul, Darryl Charles, Michael McNeill and David McSherry. – A paper on “stable but dynamic environments.” Perhaps the most useful to my research, this paper advocates an unscripted experience shaped not only by user interaction but by autonomous NPCs. A framework architecture for the world is provided, along with a partial implementation and results. My plan is to study their architecture as a jumping off point for my own, trying to push past just dynamically generating a story to a place where the game is aware if that story is any good, and is able to adjust its direction if not. [PCMM11]

*Supporting Rereadability Through Narrative Play.*  
Alex Mitchell, Kevin McGee (SG). – An exploration into what makes a story interesting to go through again, and the differences between replaying and rereading. One interesting element is that with the game implementation at the heart of this paper, the authors found that people replayed not to find better narrative closure but to “do better than last time.” I actually plan on using this paper as a guide for what to avoid… My goal is not to construct a game where one replays to get a new story, and not to do better than before. I think a good way to handle this is to take out many “losing” scenarios for the player, in which the player is more of a catalyst for what happens to NPC characters in the game.

*Why Paris Needs Hector and Lancelot Needs Mordred: Using Traditional Narrative Roles and Functions for Dramatic Compression in Interactive Narrative.*Janet H. Murray (US). – A more specific exploration into abstracting character types and immediately recognizable story threads in such a way they can be parameterized and controlled. More useful to the actual building of my story world and character/plot thread interactions than the MIST paper, which focuses more on A.I. and architecture than on how to make the story itself work in a meaningful way. [Mur11]

*Back-Leading through Character Status in Interactive Storytelling.* Jichen Zhu, Kenneth Ingraham, J. Michael Moshell (US). – A fascinating paper on dynamic, real time storybuilding that equates the “best of” scenario for interactive storytelling with improvisational theater. At the end of the paper, a technique is presented for handling status shifts to the story, and while it isn’t the most robust method presented in one of my resources, it comes from a radically different and intriguing angle. [ZIM11]

*Hooked! – Evaluating Engagement as Continuation Desire in Interactive Narratives.* Henrik Schoenau Fog (DK). – A really interesting paper that would honestly only factor into my own implementation if I finished the demonstration component significantly ahead of schedule. This paper proposes ways to measure user engagement with the story during the actual progression, giving the program the ability to shift gears and change the story if it seems like the user is losing interest. While this could obviously have huge benefits to a dynamically generated story system such as my own, it also not intrinsic to the system I am hoping to implement. [Sch11]

# PROJECT PROPOSAL

Once more, the intended goal of this project is to discover an alternative means to the tree method of interactive narrative, and to implement a basic system capable of dynamically generating original and decently well-crafted stories. The way I hope to approach this is by crafting multiple A.I.s (particularly characters) capable of interacting with one another as well as with the audience controlled character/elements, and having these elements governed by an A.I. that keeps track of potential story conflicts, subplots, and resolutions.

## Anticipated Approach

There is nothing overly complicated about my intended approach. Depending on what my research shows, I plan on enacting A.I.s that are built to interact with each other in such a way that the “audience” can follow the interactions. Each character A.I. will be given a backstory and history with other characters, and will be designated to react a certain way if certain characters say or do any important things.

One element of my intended approach is to give characters emotional ranges that affect their interactions with other characters, items, and locations. Ideally, I will start with just the emotions of “love” and “anger” – the two most common instigators of conflict in narrative storytelling. Certain character behaviors will be governed by their emotions or will trigger heightened emotions in other characters based on prewritten backstories. A character in a heightened emotional range might do something extreme, which would serve as an obvious inciting incident for our story. I can also then “jitter” the starting emotional range, adding an element of randomness to which character might trigger the story, how, and why.

The governing A.I. will be potentially the most challenging element to implement, as it must detect “story beats,” like inciting incidents, subplots, and resolutions, and jettison any developments that derail the flow of the story before the user is made aware of them.

## Target Platforms

The A.I.s will likely be written in C++. It’s unknown to me as of now whether or not the final game demonstration will be done graphically, but if it is then obviously extra software will be needed.

## Evaluation Criteria

If my project is successful, playing the game should give the user a feel that they are impacting the narrative in some significant way. Each play through the game should yield different results, and the story elements of the game should vary enough that even after several playthroughs they still feel fresh and unpredictable. Comparing this implementation to already existing work, I hope my system will provide more variation with fewer assets. Which is to say, I hope my system demonstrates how wildly the story can vary even with only a few very limited characters, items, and locations.

# RESEARCH TIMELINE

**Project Milestone Report (Alpha Version)**

* Completed all background reading
* Constructed an in depth model for a hypothetical narrative A.I. capable of discriminating and guiding a dynamically generated story.
* Proposed software framework is functioning with simple base case

**Project Final Deliverables**

* Basic game with greatly variable story created in real time using narrative A.I.
* Demonstrational video
* Documentation

**Project Future Tasks**

* Build out the storytelling A.I. into a full storytelling engine that supports stories in all forms and genres, that can have story conditions set by users (instead of hard coded in for demonstrational purposes).
* Expand out A.I. of characters. In particular flesh out character emotions and emotional responses.
* Make locations more substantial, so that setting can affect genre and character moods.

You will fill in the following sections as you make progress on your project, particularly for the alpha review and the final deliverable. In these sections, list pseudo-code, charts, images, examples, etc. to show what you’ve done over the course of the semester.

# Method

# RESULTS

# CONCLUSIONS and FUTURE WORK

**APPENDIX**

1. **Optional Appendix**

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# References

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**Figure 1:** *Intended Schedule*